

**ABE 4043C**  
**Biological Engineering Design 2 (Capstone Design)**

**Class Periods:** MW Period 8, 3:00 – 3:50 PM

**Location:** Frazier Rogers Hall Rm. 110

**Academic Term:** Spring 2023

**Instructor:**

Ziyne Boz

[ziynetboz@ufl.edu](mailto:ziynetboz@ufl.edu)

(352) 294-7690

Office Hours: MW 4:00-5:00 PM. Students should send a request through scheduling and text tools through the course Microsoft Teams specific team channel.

\* Students must email the instructor for arranging meetings outside of office hours

**Teaching Assistant**

- Shreeja Sreekumar, [shreejasreekumar@ufl.edu](mailto:shreejasreekumar@ufl.edu), Office hours with TA should be scheduled via email or course Microsoft Teams channel.

**Course Description**

Senior capstone design project (2 credits.)

**Course Pre-Requisites / Co-Requisites**

Prerequisite: senior standing (4EG), ABE 4042C, specialization courses

**Course Objectives**

The goal of the course is to train students to apply the engineering design process by comprehensive hands-on experience. Students who complete the course will demonstrate the ability to:

- Design engineered systems with consideration of public health, safety, and welfare,
- Design engineered systems with consideration of global, cultural, social, environmental, and economic factors
- Communicate effectively with a range of audiences

**Materials and Supply Fees**

N/A

**Contributions of Course to Meeting the Professional Component for ABET:**

This required course counts for 2 credit hours of "Engineering Design" towards completion of the 55 hour "Professional Requirements" of the undergraduate curricula for all options of the BS.

**Relation to Program Outcomes (ABET):**

The ABE program utilizes 1-7 student outcomes as detailed below. This course assesses student outcomes number 2 and 3 and addresses each outcome at various levels.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	High
3. An ability to communicate effectively with a range of audiences	High

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

### **Required Textbooks and Software**

1. 2008. *FE Supplied-Reference Handbook*, Eighth Edition. National Council of Examiners for Engineering and Surveying. Clemson, SC. 258 pages. (\$18 for a print copy @ www.ncees.org)
2. Daily Calendar (e.g. Daytimer), pad, phone or laptop computer w/ calendar application.
3. Access to Microsoft Office 365 or compatible Office Suite (word processor, spreadsheet, presentation programs compatible with the \*.docx, \*.xlsx and \*.pptx formats) AND Microsoft Teams

Copies of all computer files associated with the project should be submitted electronically at the same time as the hard copies of the update and final reports. Each student should have an account on the Agricultural and Biological Engineering Department network to be used in this course for sending and receiving e-mail, for storage of project documents and for accumulation of the student's portfolio. Other accounts are acceptable for e-mail and document storage if they can transmit all the required information (e.g., Gmail, yahoo mail, etc.).

### **Source Materials**

- *Engineering Design Process*, Yousef Haik and Tamer M. Shahn, 2011, Second edition, ISBN 13: 978-0-495-66814-5
- *Product Design: Techniques in Reverse Engineering and New Product Development*, Kevin Otto & Kristin Wood, 2001, ISBN 0-13-021271\_7
- *Massachusetts Institute of Technology Engineering Design Program 2.009 Engineering Design Process*
- *Dym, C. & P. Little. 2008. Engineering Design: A Project Based Introduction*. Third Edition. John Wiley & Sons, Inc. New York. 352 pages.
- Christianson, L. & R. Rohrbach. 1986. *Design in Agricultural Engineering*. American Society of Agricultural Engineers. St. Joseph, MI. 312 pages.
- Eide, Arvid R., Roland D. Jenison, Lane H. Mashaw and Larry L. Northup. *Engineering Fundamentals and Problem Solving* (2nd Ed.). McGraw-Hill, Inc., New York. 492 pp.
- Pahl, G., W. Beitz & J. Feldhusen. 2007. *Engineering Design: A Systematic Approach*. Third Edition. Springer-Verlag New York, LLC. New York. 617 pages. Keller, J. and R.D. Bliesner. 1990. *Sprinkle and Trickle Irrigation*. Van Nostrand Reinhold. New York. 652 pages.
- Petroski, H. 1998. *Invention by Design: How Engineers Get from Thought to Thing*. Harvard University Press. Cambridge, MA. 256 pages.
- Voland, G. 2003. *Engineering By Design*. Prentice Hall. Second Edition. New York. 575 pages.

**Course Schedule\***

<b>Week</b>	<b>Topic</b>	<b>Product Reviews</b>	<b>Deliverable</b>
1	Class overview, tools, and expectations <b>Workshop:</b> Revisiting customer needs and value proposition <b>Activity:</b> Establishing customer needs, interpreted need, and business case		High energy, enthusiasm, and excitement!
2	<b>Workshop:</b> Generating concepts, benchmarking, function tree, and selection of the concept.		<ul style="list-style-type: none"> <li>• Updated project deliverables document</li> </ul>
3	<b>Training:</b> Concept Embodiment, Failure Modes and Effects Analysis <b>Activity: Review</b>	<b>Three sketch model review</b>	<ul style="list-style-type: none"> <li>• Brainstorming, value proposition, and concept selection</li> <li>• Three sketch model review presentation</li> <li>• Three sketch model review reflection</li> </ul>
4	<b>Training:</b> Modeling product metrics (Flows, physical mechanisms, governing equations) <b>Workshop:</b> Material, Energy and Information Flows		<ul style="list-style-type: none"> <li>• <b>Design Report Update:</b> Problem Statement, External Search, Selected Solution</li> </ul>
5	<b>Training:</b> Design for manufacture and assembly <b>Workshop:</b> Design for assembly analysis		
6	<b>Training:</b> Design for the environment, Incorporating Life-cycle thinking and sustainability into design <b>Activity: Review</b>	<b>Mockup/Assembly Model Review</b>	<ul style="list-style-type: none"> <li>• Mockup/Assembly Model review presentation</li> <li>• Mockup/Assembly Model review reflection</li> </ul>
7	<b>Training:</b> Essentials of Physical Prototypes <b>Workshop:</b> Prototyping		<ul style="list-style-type: none"> <li>• <b>Design Report Update:</b> Project details</li> </ul>
8	<b>Training:</b> Prototype construction <b>Workshop:</b> Rapid Prototyping		
9	<b>Training:</b> Physical Models and Experimentation <b>Activity: Review</b>	<b>Physical Prototype Review</b>	<ul style="list-style-type: none"> <li>• Prototype review presentation</li> <li>• Prototype review reflection</li> </ul>
10	<b>SPRING BREAK</b>		
11	<b>Workshop:</b> Product Experience Storytelling, product naming <b>Activity:</b> Design Work		<ul style="list-style-type: none"> <li>• <b>Design Report Update:</b> Design attributes/results</li> </ul>
12	<b>Workshop:</b> Guest speaker <b>Activity: Review</b>	<b>Technical Review</b>	<ul style="list-style-type: none"> <li>• Technical review presentation</li> <li>• Technical review reflection</li> </ul>
13	<b>Workshop:</b> Guest speaker <b>Activity:</b> Design work		<ul style="list-style-type: none"> <li>• <b>Design Report Update:</b> Design recommendations, design significance</li> </ul>
14	<b>Workshop:</b> Guest speaker <b>Activity: Review</b>	<b>Final Design Review</b>	<ul style="list-style-type: none"> <li>• Final design review presentation</li> <li>• Final design review reflection</li> </ul>
15	<b>Workshop:</b> Guest speaker <b>Activity: Podcast interviews</b>		<ul style="list-style-type: none"> <li>• Podcast recordings</li> </ul>

16	April 26 (The last day of classes) <b>Design Poster Presentation</b>		<ul style="list-style-type: none"> <li>• <b>Printed poster</b></li> <li>• <b>Product sheet</b></li> </ul>
<b>Finals Week</b>	Congratulations!		<b>May 3<sup>rd</sup>: Final Deliverables Due (Wednesday)</b> <ul style="list-style-type: none"> <li>○ Final Report</li> <li>○ Design Notebook</li> <li>○ Codes</li> <li>○ Additional deliverables stated in the Project deliverables document</li> </ul>

*\*The schedule of the class is subject to change and any changes will be announced in-class.*

Engineering Design Project Milestones can be summarized as below:

**Milestones:**

- Brainstorming and Value Proposition
- Updated Project Deliverables
- Three sketch model review
- Mockup-Assembly Model review
- Prototype review
- Technical review
- Final design review
- Design poster presentation to the stakeholders

**Deliverables:**

- Poster
- Product Sheet
- ABE Capstone Podcast Interview
- Final Design Report (With four report updates throughout the semester)
- Engineering Design Notebook
- Other deliverables stated in the Updated Project Deliverables document

***Attendance Policy, Class Expectations, and Make-Up Policy***

Attendance is required for this course – Lectures will cover material from various references, so it is imperative that students make every effort to attend classes and take good notes. Students are especially encouraged to ask questions during lectures.

All deliverables will comply with the requirements and due date specified at the time of assignment (no deliverable will be made do earlier than 3 business days after assignment). **No late deliverable will be accepted.**

The student is expected to manage their time efficiently and should anticipate spending three times the length of lectures studying and preparing deliverables outside the classroom. The student should focus on the following: assignments and review milestones, preparing design reports and prototypes, review of notes and lecture materials, and assigned readings.

**Announcement Policy:** Students will be held responsible for *all* announcements made in class, which includes *any and all* changes to this syllabus and the course lecture schedule. Students are expected to attend all lectures and laboratory periods scheduled.

**Grading Policy:** Official individual grades will only be available at the end of the semester. While many project grades will be determined at the completion of each project, individual grades will be modified based on team and self-assessments conducted throughout the semester.

**Communication Policy:** In order to maximize time efficiency, the official Microsoft Teams channel of the class will be utilized for communications among the team members, design notebooks, scheduling office hours, asking questions to instructor and the T.A., and other communication purposes. Questions and comments will be

monitored regularly, and students should use the mention function by using “@” handle to send notifications to both instructor and TA. Make-up, grade, or other specific questions should be directed at instructor’s email or through Canvas. MS Teams channel is synched automatically with the Canvas website. The Canvas will still be used for assignment submissions, grading, class material storage, instructor announcement and any other activities.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Brainstorming and Value Proposition	100	5
Updated Project Deliverables	100	5
Design report updates (x4) 100 Each	400	5
Three sketch model review	100	5
Mockup-Assembly Model review	100	10
Prototype review	100	10
Final Design Review	100	10
Engineering Design Notebook	100	5
Poster Presentation	100	10
Product Sheet	100	5
ABE Capstone Podcast Interview	100	10
Final Design Report	100	15
Instructor and Mentor Incentive	100	5
<b>TOTAL</b>	<b>1600</b>	<b>100</b>

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.a.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.a.ufl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **Software Use**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### **Student Privacy**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### **Campus Resources:**

#### Health and Wellness

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

#### Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.

<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>;<https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <https://distance.ufl.edu/state-authorization-status/#student-complaint>.